Finance and Oil. Is there a Resource Curse in Financial Development?

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Finance and Oil

Is there a resource curse in financial development?

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Abstract: This paper shows that the finance and growth relationship is as important in resource-based economies as in other economies. This paper also documents less developed financial systems in resource-based economies and banks that are more liquid, better capitalized and more profitable, but give fewer loans to firms. Firms in resource-based economies use less external finance and a smaller share of them uses bank loans, although there is the same level of demand as in other countries, thus pointing to supply constraints. Overall, there is some indication of a natural resource curse in financial development, which falls more on enterprises than on households. This calls for intensified efforts in resource-based economies to deepen and broaden financial systems.

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1. Introduction

An extensive literature has identified financial sector development as a critical factor in inclusive economic development (see Levine, 2005 and Beck, 2009 for overviews). Countries with deeper financial systems grow faster and it is the lowest income quintile that benefits most from this deepening (Beck, Levine and Loayza, 2000; Beck, Demirguc-Kunt and Levine, 2007). Countries with deeper financial systems also experience faster reductions in income inequality and poverty rates. Financial sector development helps industries that are most reliant on external finance grow faster and helps enterprises, especially smaller and more opaque ones, overcome financing constraints (Rajan and Zingales, 1998; Beck, Demirguc-Kunt and Maksimovic, 2005). The positive effect of financial sector development on economic growth comes through improved resource allocation and productivity growth rather than increased capital accumulation (Beck, Levine, and Loayza, 2000; Wurgler, 2000).

Most of this literature, however, has focused on broad cross-country samples, assuming that the finance-growth relationship is a linear one, constant across countries.[1] It is more; many papers in the finance and growth literature drop oil countries or natural-resource-based economies in general, arguing that economic development is driven by different factors in these countries and that the financial sector has a different role and structure in these economies.

This paper focuses on financial deepening in resource-based economies. Specifically, we (i) test whether the finance and growth relationship varies across countries depending on the degree to which they rely on natural resources, and (ii) document the development and structure of financial system in natural resource based economies compared to other countries. In the first part, we will use standard cross-country growth regressions as well as industry-level regressions and allow for a differential relationship between finance and

[1] There are several papers, however, that have shown non-linear finance-growth relationships, including Aghion, Howitt and Mayer-Foulkes (2005) and Rioja and Valev (2004a,b).

economic growth depending on the degree to which an economy relies on natural resource exports or is abundant in natural resource wealth. In the second part, we will use aggregate, bank-level and firm-level data to explore whether the depth, breadth and efficiency of financial systems varies systematically across countries with different degrees of natural resource reliance.

Exploring the role of financial sector development in growth of resource-based economies is interesting and important for both academics and policy makers. There is a large literature on the natural resource curse and the different channels through which resource abundance can influence growth; understanding the role of financial development in this context is critical. Policymakers who care about the development of their countries need to understand the relative importance of different policy areas and the effectiveness of specific policies. Understanding channels through which resource abundance can stimulate or dampen economic development can be important to develop policies to maximize the benefits of natural capital.

By exploring the role and structure of the financial system in resource-based economies, this paper builds on a large literature that has explored the curse of natural resource abundance (see van der Ploeg, 2011 for a recent survey). The natural resource curse refers to the crowding out of non-resource based activities or investment through price and incentive effects. One form - also referred to as Dutch disease – works through the exchange rate mechanism: commodity exports will put upwards pressure on the real exchange rate, which will turn non-resource exports uncompetitive, ultimately depressing the traded goods sector. The decline of British manufacturing after the discovery of oil in the 1970s and the decline of the Dutch manufacturing sector after the discovery of a natural gas field in 1959 are prominent recent examples, although neither of them lasted. Beyond price effects, the natural resource curse also refers to the distortion of incentives for investment in institutions,

education and other public services due to windfall gains from natural resources, which can ultimately have negative repercussions for political freedom and stability. It is generally easier to materialize short-term profits from natural resources such as oil than from fixed assets such as manufacturing plants, equipment and machinery, because proceeds from natural resources depend less on the creation of a market, on human capital, and on R&D investment. This in turn reduces incentives to invest in an institutional framework that supports broad domestic market-based exchange, private property rights and the contractual framework supporting non-commodity production (Besley and Persson, 2010). Natural resource wealth also allows less than democratic governments to buy off opposition, avoid accountability and prevent transparency. Natural resources make it more profitable for the elites to hang on to power and block the development of an open society (Beck and Laeven, 2006). This, in turn, can foster conflict, seen most prominently across Sub-Saharan Africa (Collier and Hoeffler, 2004). In addition, a commodity-induced bonanza can foster a shift from profit-making entrepreneurship towards socially inefficient rent seeking. However, there is also an interaction between institutional development and resource abundance, with countries above a threshold of institutional development able to reap benefits from natural resource wealth (Mehlum, Moene and Torvik, 2006).

The empirical literature has provided ample evidence for the natural resource curse and the different channels through which it affects growth. However, this literature has also noted a wide cross-country variation in experiences; on the one hand, Nigeria has experienced negative growth since its independence, associated with exchange rate effects, rent-seeking and violence stemming from oil exports, while, on the other hand, Botswana has experienced positive growth over the past 50 years in spite of being heavily reliant on diamond exports. However, according to Gylfason (2001), only four out of 65 resource-based economies can be considered success stories in terms of growth - Indonesia, Malaysia,

Thailand and Botswana - and the three Asian countries still fared less well than their East Asian neighbors Hong Kong, Singapore or South Korea. With few exceptions, however, the literature has not considered the effect of natural resource abundance on financial development or its role in mitigating the natural resource curse (van der Ploeg and Poelhekke, 2007).[2]

In exploring whether there is a natural resource curse in financial development, this paper also builds on a large literature on the determinants of financial deepening across countries. Boyd, Levine and Smith (2001) show the importance of macroeconomic stability for financial deepening, while La Porta et al. (1997, 1998) and Djankov, McLiesh and Shleifer (2007) show the importance of the contractual and information frameworks for financial development.[3] A related literature has explored the importance of historic factors, such as legal tradition, or geographic traits in forming institutional and specifically financial development (see Beck and Levine, 2005, for a survey).

Theory and the institutional literature on the natural resource curse provide different hypotheses on the effect of natural resource abundance on financial system development. There are both demand side and supply side effects in this respect. Take first the demand side. On the one hand, windfall gains from natural resource abundance and the consequent expansion of the non-traded goods sector can lead to higher demand for financial services, including consumer credit. On the other hand, there is lower demand for external financing from the natural resource sector than from non-resource traded goods sector, which will suffer in a Dutch disease scenario. Further, the literature has documented lower savings and investment rates in resource-based economies, which in turn can also explain a lower demand

[2] One of the few exceptions is Bhattacharyya and Hodler (2010) who show a negative relationship between resource dependence and financing development in countries with low levels of democracy using country-level data, and Barajas, Chami and Yousefi (2010) who explore the finance and growth relationship across countries with different degrees of resource dependence. Gylfason (2004) also offers some suggestive evidence of lower financial development in resource-based economies.

[3] See Beck (2006) for an overview.

for financial services in resource-based economies. Specifically, resource-rich countries can use the revenues from their resources for consumption smoothing, which weakens the incentive to build an effective financial system to serve as a buffer to smooth consumption over the business cycle (Gylfason, 2004). Take next the supply side. Higher investment in the natural resource sector can lead to lower investment in the financial sector and draw away skills from the financial system. In addition, the heavy dependence of the financial system on a sound institutional framework, including an effective contractual framework, can hamper financial deepening in countries where natural resource abundance undermines institutional development.

Theory also makes ambiguous prediction about the finance-growth relationship in resource-based economies. On the one hand, the financial system might be less important as growth depends less on finance-intensive sectors. On the other hand, financial system development might be more important to compensate for the negative effects of Dutch disease and in order to diversify the economy. In addition, financial systems in resource-based economies can help counter the negative impact of real exchange rate volatility (Aghion et al., 2009).

Our empirical results show that financial development is as important for economic growth in resource-based economies as in other countries. On the other hand, resource-based economies have less developed financial systems and their banks are more liquid, better capitalized and more profitable, but give fewer loans to firms. Firms in resource-based economies use less external finance and a smaller share of them uses bank loans, although there is the same level of demand as in other countries, thus pointing to supply constraints. Overall, there is some indication of a natural resource curse in financial development, which falls more on enterprises than households.

As this paper is one of the first to rigorously explore the role of financial systems in resource-based economies, several caveats are due. First, we work with very rough measures of natural resource dependence; we test, however, the robustness of our results across several indicators. Second, this is a very broad but preliminary exploration of the role of financial systems in resource based economies; what we gain in breadth, we miss in depth in the different dimensions. Several of the topics explored in this paper can be subject to more in-depth explorations that also have to address issues of identification.

This paper is related to a small literature on the institutional resource curse. Beck and Laeven (2006) show that variation in the extent of natural resources across transition economies can partly explain variation in institution building after 1990, when all these countries faced the same challenge of building market-compatible institutions. Cross-country regressions have confirmed this negative relationship between natural resource abundance and the rule of law (Norman, 2009), control of corruption (Papyrakis and Gerlagh, 2004) and overall institutional capacity (Isham et al., 2005).

The remainder of the paper is structured as follows. Section 2 assesses whether the finance and growth relationship varies across countries with the degree of importance of commodities in the economy. Section 3 explores whether commodity-based economies have lower levels of financial development, thus a test of the resource curse for financial system development. Section 4 analyzes banks' balance sheets and income statements to show whether banks are different in resource-based economies. Section 5 uses firm-level survey data to explore difference in firms' use of external finance and firms' financing obstacles across countries with a different reliance on natural resources and aggregate outreach data. Section 6 concludes and provides some policy discussion.

2. Finance and growth – is there a natural resource discount?

This section explores whether the positive relationship between financial development and economic growth varies across countries with the degree of natural resource reliance. In order to do so, we use Barro-style standard cross-country finance and growth regressions, adding a variable capturing natural resource reliance or abundance plus its interaction with financial development.

We use two indicators to gauge the reliance of economies on natural resources. The first indicator is *Natural Resource Exports*, which is the sum of fuel, ores, and metal exports relative to GDP.[4] Data come from World Development Indicators and are available for a broad cross-section of countries on an annual basis over the period 1960 to 2007. The second indicator is *Subsoil Assets* per capita and refers to natural assets (World Bank, 2006). It is computed as the net present value of the income these resources are able to produce, calculated for the year 2000. Natural Resource Exports ranges from zero in countries like Mauritius to almost 100% in many oil-exporting countries. Similarly, Subsoil Assets per capita ranges from zero in countries like Singapore to 80,000 USD in Saudi Arabia. Given the wide variation, we use the log of one plus Subsoil Assets in our regressions. It is important to note that there are important differences between these two measures, with Natural Resource Exports referring to the realized income stream based on the resources and Subsoil Assets to the actual wealth.[5] However, the two measures are highly and significantly correlated with each other, suggesting that most economies that are abundant in natural resources also rely on natural resources as export good. It is important to note that both measures have their shortcomings. The ratio of Natural Resource Exports to GDP can be driven as much by the numerator as by the denominator and depends very much on the extraction rate. Subsoil Assets per capita is a more direct measure of natural resource wealth,

[4] We therefore abstract from agricultural commodities,

[5] Brunnschweiler and Bulte (2008) point to important differences in the effect of natural resource dependence and natural resource abundance on institutional and economic development.

but relies heavily on assumptions about reserves and extraction costs (Van der Ploeg and Poelhekke, 2010).

As indicator of financial development, we use a standard indicator from the literature, *Private Credit*, which is the total claims by financial institutions outstanding on the domestic nonfinancial private sector, divided by GDP. This indicator ranges from less than 2% in DRC to almost 150% in Switzerland. As alternative indicator, we use *Liquid Liabilities* to GDP, which is defined as currency plus demand and interest-bearing liabilities of banks and nonbank financial intermediaries, divided by GDP, and thus focuses on banks' liability side. Both indicators are from the World Bank's Financial Development and Structure Database (Beck, Demirguc-Kunt and Levine, 2010). All other macroeconomic indicators are from the World Development Indicators (WDI) of the World Bank.

We average real GDP per capita growth over the period 1980 to 2007 and run the following regressions:

$$g(i) = \alpha_1 + \beta_1 \text{Private Credit (i)} + \beta_2 \text{Private Credit (i)} * \text{Natural Resources (i)} + \\ + \beta_3 \text{Natural Resources (i)} + \gamma' C(i) + \varepsilon(i) \qquad (1)$$

where β_1 captures the general effect of financial development on growth, while β_2 captures the differential effect in economies that are more resource based. Following the finance and growth literature, our set of conditioning information includes (i) the log of initial real GDP per capita to control for convergence, (ii) average years of schooling to control for human capital accumulation, (iii) the share of exports and imports to GDP, (iv) the inflation rate and (v) the ratio of government expenditures to GDP.[6] With the exception of initial GDP per capita, all explanatory variables are averaged over the sample period 1980 to 2007.[7]

[6] Similar sets of conditioning information were used by Beck, Levine and Loayza (2000) and Beck and Levine (2004).

[7] In the context of this paper, we will not address issues of causality and omitted variable. A large literature has shown that the relationship between financial development and growth is robust to controlling for biases due to endogeneity, measurement and omitted variables. See Beck (2009) for a survey.

The Table 1 results do not show any significant difference in the finance and growth relationship with the degree of natural resource reliance. The column 1 results confirm findings of the cross-country finance and growth literature of a positive relationship between financial development and long-run economic growth, while the column 2 results do not show any differential effect of financial development on growth in resource-based economies as the coefficient on the interaction term enters negatively, but insignificantly. Columns 3 and 4 confirm our findings using our alternative indicator of natural resource abundance, Subsoil Assets, and our alternative indicator of financial development, Liquid Liabilities, respectively. Among the control variables, government consumption enters negatively and significantly, while years of schooling enter positively and significantly. Initial GDP per capita enters negatively, though not consistently significant, while trade openness enters positively, but not always with a significant coefficient. Finally, inflation enters insignificantly, which can be explained by the negative impact that inflation has on financial development (Boyd, Levine and Smith, 2001) and which thus indirectly affects economic growth. In unreported regressions, we also use a dummy variable for countries with Natural Resource Exports greater than 10% of GDP and confirm our findings. Finally, we control whether the insignificant coefficient estimate for the interaction term is not driven by the absence of a non-linear term of Private Credit to GDP; controlling for a squared term of Private Credit to GDP does not change our findings.

Columns 5 and 6 consider the relationship between finance and income inequality. Building on previous work by Beck, Demirguc-Kunt and Levine (2007), we regress the average annual growth rate in the Gini coefficient on financial development, Natural Resource Export, their interaction and a set of conditioning information.[8] We find that

[8] We focus on the change in income distribution rather than the level as complement to the GDP per capita regressions. Specifically, changes in relative and absolute poverty levels can be decomposed into changes in average income growth (i.e. GDP per capita growth) and changes in income inequality. While columns 1 – 4 of

financial development has a negative relationship with the growth rate in the Gini coefficient, while Natural Resource Reliance has a positive, thus inequality-increasing, impact. The interaction term between the two, on the other hand, does not enter significantly.

The results in Table 1 suggest that the finance and growth and the finance and inequality relationships hold as much for resource-based economies as for other economies. The insignificant interaction term between natural resource dependence and financial development, however, can also be interpreted as indicating that financial development does not have a dampening impact on the negative role of natural resources in the overall growth process.

In a second step, we test whether industries that are more dependent on external finance grow faster in countries with deeper financial systems and whether this relationship depends on a country's reliance on natural resources. This test follows the seminal work by Rajan and Zingales (1998) who show that financial development is indeed beneficial for industries that depend more on external financing sources, where this demand is measured for large U.S. corporations that face a flat supply curve. As financial deepening is especially relevant for manufacturing, a sector, on the other hand, that might easily be crowded out by natural resource abundance, this test seems especially relevant in the context of our assessment whether the finance and growth relationship holds for natural resource countries as much as for other countries. Specifically, we extend the Rajan and Zingales (1998) test as follows:

$$g(i,k) = \alpha(i) + \lambda(k) + \beta_1(\text{External}(k)*\text{Private Credit}(i)) + \gamma\text{Share}(i,k) + $$
$$+ \beta_2(\text{External}(k)*\text{Private Credit}(i)*\text{Natural Resources}(i)) + \varepsilon(i,k) \qquad (2)$$

where g(i,k) is growth of industry k in country i, averaged over the 1980s, External(k) is an industry-level measure of external dependence that does not vary across countries, α and λ are

Table 1 focus on the former, columns 5 and 6 focus on the latter. See Beck, Demirguc-Kunt and Levine (2007) for a more detailed discussion.

vectors of country and industry dummies, respectively, and *Share* is the initial share of industry *k*'s value added in total manufacturing value added of country *i*. By including industry and country specific effects, the coefficients β measures the differential growth impact of financial development on high-dependence industries relative to low-dependence industries. While β_1 captures the overall effect of financial development on industry growth dependent on the need of the industry for external finance, β_2 measures the differential effect of this interaction depending on the abundance or reliance of the country on natural resources. We also include the interaction between external dependence and natural resources.[9]

Table 2 shows weak evidence that the finance and growth relationship might be even stronger for countries that rely more on natural resources. While the interaction between Private Credit and External Dependence enters positively and significantly, the triple interaction with Natural Resource Exports enters positively but insignificantly (column 1). We find similar findings when using Subsoil Assets, though here the interaction between Private Credit and External Dependence also enters insignificantly, possibly due to multicollinearity with the triple interaction term (column 2). When we use the Natural Export Dummy (indicating Natural Exports greater than 10% of GDP), however, the triple interaction enters positively and significantly at the 10% level (column 3), providing some evidence that the role of the financial system in channeling funds to manufacturing industries that need them most might be even more important in resource-based economies.

Summarizing, this initial evidence does not provide strong evidence that the relationship between finance and growth differs across countries with the degree of natural resource abundance, and neither does the relationship between finance and changes in income inequality. Financial development is not less important for growth in resource-based

[9] We do not have to (and cannot) include the interaction between Private Credit to GDP and natural resources in the presence of country dummies.

economies and possibly even more important! These results are certainly not conclusive and more work is needed in this area, especially using industry and firm-level data and disaggregating GDP into the resource-related and non-resource-related component. Preliminary work by Barajas, Chami and Yousefi (2010) shows that there might be a differential effect if one considers panel rather than cross-country regressions, with financial development having lower if not negative impact on growth in oil-exporting countries. In related work, Van der Ploeg and Poelhekke (2009) show that financial development has a dampening impact on volatility in resource based economies, with positive repercussions for economic growth. *Prima facie*, policymakers in resource-based economies should thus care about financial sector deepening as much as policymakers in other countries.

Having shown that financial development is as important for economic growth in resource-based economies as in other countries, we now explore whether the development and structure of financial systems differs across countries with different degrees of resource abundance.

3. Finance and natural resources – is there a resource curse?

This section explores whether there is empirical evidence for a resource curse in financial development. Specifically, we assess whether economies more reliant on natural resources have lower levels of financial development after controlling for standard factors associated with cross-country variation in financial development.

Controlling for economic development, we find that countries that rely more on natural resource exports have lower levels of Private Credit. Figure 1 presents a partial scatter plot of Private Credit and Natural Resource Exports, controlling for GDP per capita. Here we present data across countries, with data averaged over the period 2000 to 2007. In the

following, we will use multivariate regression analysis to assess the robustness of this finding to controlling for other determinants of financial development.

The literature has pointed to macroeconomic stability and the efficiency of the contractual and information frameworks as important determinants of financial sector development (Boyd, Levine, and Smith, 2001; Djankov, McLiesh and Shleifer, 2007). In our analysis, we therefore control for (i) the log of real GDP per capita, averaged over the sample period (ii) the average inflation rate between 2000 and 2007, (iii) time to enforce a contract in number of days, and (iv) the efficiency of the credit information system, with the latter two measures averaged over the period 2003 to 2007. Specifically, we run the following regressions.

$$\text{Private Credit}(i) = \beta \text{Natural Resources}(i) + \gamma' C(i) + \varepsilon(i) \qquad (3)$$

In addition to the two financial system indicators introduced above, we focus on several other indicators, all from the Financial Development and Structure Database (Beck, Demirguc-Kunt and Levine, 2010). The *Loan-Deposit Ratio* is a measure of intermediation efficiency and is the ratio of total banks' claim outstanding on domestic, non-financial sectors, and total bank deposits. Higher ratios indicate higher intermediation efficiency; ratios above one, however, might indicate overheating of the financial system. We also use two indicators to gauge the development of the stock market. Specifically, *Stock Market Capitalization* to GDP is a measure of stock market size relative to real economic activity and *Stock Market Turnover* is an indicator of stock market trading relative to stock market capitalization, thus a measure of the liquidity of the market.

In addition to the financial development indicators defined above, we consider the relationship between natural resource reliance and two indicators of financial structure, i.e. the degree to which a financial system is market or bank-based. Following Beck and Levine (2002), we define *Structure-Size* as the ratio of Stock Market Capitalization and Bank Assets,

where the latter is defined as total banking claims on non-financial (private and public) domestic sectors. Higher ratios would indicate a financial system that is more market-based. *Structure-Efficiency* is defined as the product of Stock Market Turnover and banks' Net Interest Margin (a negative indicator of bank efficiency). Higher numbers would again indicate a financial system that is more market-based.

Table 3 shows that countries that are more reliant on natural resource exports have lower levels of financial development, even after controlling for other determinants of financial development. The effect is not only statistically, but also economically large. Take the example of column 1. One standard deviation higher Natural Resource Exports imply 10 percentage points lower Private Credit.[10] Consistent with the literature, there is a negative relationship of inflation and contract enforcement inefficiency, while the efficiency of credit information sharing does not enter significantly. Consistent with Figure 1, the log of GDP per capita enters positively and significantly. The column 2 results confirm this finding using Subsoil Assets as indicator of natural resources, while column 3 confirms the results using Liquid Liabilities. The column 4 results show that lower levels of financial intermediation do not imply lower intermediation efficiency as Natural Resources does not enter significantly in the regression of the aggregate Loan-Deposit Ratio. The columns 5 and 6 results show that economies that rely more on natural resources do not have smaller stock exchanges, but significantly less liquid ones. Natural Resource Exports enters insignificantly in the regression of Stock Market Capitalization to GDP, but negatively and significantly in the regression of Stock Market Turnover. The columns 7 and 8 results, finally, show that when measured by size, resource-based economies have more market-based financial systems, while when measured by efficiency, they have more bank-based financial systems. Given

[10] It is important to note, however, that not all resource-based economies have a lower level of Private Credit than predicted by the other variables. Norway and other high-income countries have even higher levels of Private Credit than predicted by the other included variables, while many developing resource-based economies have significantly lower levels. This points to further exploration of differential effects of natural resource abundance in future research.

the previous results we can interpret this as suggesting that the market-based nature in terms of size stems from the smaller banking systems in resource-based economies, while the bank-based nature in terms of efficiency stems from the lower stock market liquidity in these countries. We confirm the findings of Table 3, using our alternative indicators of natural resource abundance, Subsoil Assets and the Natural Resource Export dummy.

The results so far have focused on cross-country variation in financial development, but there is also a large variation within countries over time. How do countries with different degrees of natural resource dependence develop their financial systems? Does natural resource abundance help or impede further financial deepening as demand for financial services increases with economic development?

Table 4 explores within-country variation of financial development as function of natural resource reliance. Specifically, here we present estimations with country-fixed effects to explore how Private Credit develops with GDP per capita over time. We focus on a longer sample period, using annual data over the period 1960 to 2007. We use this sample to assess how the financial system deepens as a function of economic development and other macroeconomic indicators, and whether these relationships vary according to the degree of natural resource reliance.

$$FD(i,t) = \beta_1 \text{ GDP per capita } (i,t) + \beta_2 \text{ GDP per capita}(i,t)*\text{Natural Resources } (i,t) +$$

$$+ \beta_3 \text{ Natural Resources}(i,t) + \gamma' C(i,t) + \delta' X(i) + \varepsilon(i,t) \qquad (4)$$

Unlike in Tab le 3, we include all indicators in logs so that we can interpret the coefficient estimates as elasticities. While β_1 shows the relationship between Private Credit and GDP per capita, β_2 indicates whether this relationship is significantly higher or lower in countries with higher reliance on natural resources. We do not include indicators of the contractual or information framework, as we have limited time-series variation and data availability in these indicators. We include country-specific fixed effects and other time-varying country variables

as explained below. By including country-specific effects, we effectively explore relationships within countries over time and abstract from the cross-country variation.

The Table 4 indicate that Private Credit increases with GDP per capita, but to a lower extent in countries that rely more on natural resource exports. While the elasticity of Private Credit to GDP per capita is almost one for countries with no Natural Resource Exports, this elasticity is significantly lower in countries with higher Natural Resources. The column 2 results show that the significant interaction between GDP per capita and Natural Resource Exports is not driven by general trade openness. While there is a positive relationship between Private Credit and the trade share, this relationship is more muted in countries with a higher reliance on natural resources.[11] The column 3 regression, on the other hand, shows that the relationship inverts when using Subsoil Assets, an indicator of natural resource abundance rather than exports. Countries with higher natural resource wealth deepen their financial systems at a faster rate than other countries. This points to an important difference between measures of resource dependence and abundance, as already noted by Brunnschweiler and Bulte (2008) and provides some indication that natural resource abundance can actually be used to the advantage of countries in financial deepening. An important, caveat, however, is that Subsoil Assets is measured in 2000, i.e. includes information that was available at this point in time, not necessarily in 1960.

The results in columns 4 and 5 show that while real exchange rate appreciation leads to deeper financial systems (though an economically very small effect), this relationship is reversed for countries with a higher share of Natural Resource Exports. This is maybe the clearest evidence of a Dutch disease effect, i.e. crowding out of non-resource exports through an appreciating exchange rate can also crowd out financial development. Interestingly, when controlling for real exchange rate changes and their interaction with natural resource

[11] When computing trade share to GDP net of natural resource exports, our findings are confirmed.

indicators, the interaction between the natural resource indicators and GDP per capita turns insignificant, which would suggest that the resource curse in financial development works indeed mainly through the Dutch disease effect of real exchange rate appreciation.

Summarizing, resource-based economies have smaller banking systems and less liquid stock exchanges than predicted by their level of economic development, degree of monetary stability and efficiency of contractual and informational framework. As resource-based economies develop economically, their financial systems deepen at a slower rate than in other countries, though this results holds for natural resource reliance (or dependence) rather than natural resource abundance. The fact that this result holds after controlling for the contractual and information frameworks suggests that the natural resource curse in financial development goes beyond the institutional natural resource curse documented in the literature (e.g., Beck and Laeven, 2006).

The findings so far are consistent with both a demand-driven and a supply-driven story, i.e. lower demand for financial services resulting in a smaller financial system or supply constraints preventing a financial system from developing. In the next two sections, we therefore focus first on indicators derived from banks' financial statements to assess whether banks in commodity-based economies are different in their business model, efficiency and stability, before turning to firm-level data to assess whether clients are underserved in resource-based economies.

4. Banks in resource-based economies

While the previous section has provided some evidence for a natural resource curse in financial development, this section digs deeper by exploring banks' business model, efficiency, stability, and asset composition to assess whether there are significant differences across banks in countries with different reliance on natural resources. We use data from

Bankscope over the period 2000 to 2007 and construct and compare indicators of business orientation, efficiency, and stability across banks and across countries with different degrees of natural resource reliance. We only include banks with at least two observations and countries with data on at least four banks. We restrict our sample to the largest 100 banks in terms of assets within a country so that our sample is not dominated by a specific country. Finally, we eliminate outliers in all variables by winsorizing at the 1^{st} and 99^{th} percentiles.

To compare the business orientation of banks, we use two indicators suggested by Demirguc-Kunt and Huizinga (2010) - the ratio of fee-based to total operating income and the importance of non-deposit funding to total funding - as well as the traditional loan-deposit ratio. Further, we use the ratio of liquid assets to total assets. Second, we use three indicators of bank efficiency. Our first efficiency indicator is overhead cost, which is computed as total operating costs divided by total assets. Second, we use the cost-income ratio, which measures overhead costs relative to gross revenues, with higher ratios indicating lower levels of cost efficiency. Third, we use the net interest margin, which is net interest revenue relative to total earning assets. All three indicators decrease in efficiency, i.e. higher numbers indicate less efficient banks. To compare the stability of banks across countries, we focus on the z-score, which is defined as the sum of capital-asset ratio and return on assets (ROA), divided by the standard deviation of ROA. It measures the number of standard deviations in ROA that a bank is away from insolvency and thus increases in the stability of banks. We also assess differences across banks and countries in the capital-asset ratio and in ROA, two of the components of the z-score.

We average data over the sample period 2000 to 2007 and run the following regression:

$$\text{Bank}(i,j) = \alpha B(i,j) + \beta_1 \text{ GDP per capita}(j) + \beta_2 \text{ Natural}(j) + \varepsilon(i,j) \qquad (5)$$

where i stands for bank and j for country. B is a set of bank-level control variables, including size (measured in logs of millions of USD of total assets), the share of non-loan earning assets in total assets and fixed assets to total assets. We control for the log of GDP per capita to prevent confounding the relationship between economic development and natural resource dependence with the relationship between natural resource dependence and bank characteristics. We apply standard errors clustered on the country level, i.e. allow for correlation between error terms of banks within countries, but not across countries to thus control for unobserved factors across banks within a country.

The results in Table 5 show few significant differences across banks according to the reliance on natural resources in the country they operate in. When it comes to business model, we find no significant differences in the share of fee income, the reliance on non-deposit funding or the loan-deposit ratio across countries with different reliance on natural resources. We do, however, find that the share of liquid assets in total assets increases as we move from countries with no natural resource exports to resource-based economies. In terms of efficiency, the only dimension where the degree of natural resource reliance seems to matter is the cost-income ratio, which is significantly lower in countries that are more resource-based. On the other hand, there are no significant differences in the net interest margin or overhead costs across countries with different reliance on natural resources. Finally, we find no significant differences in stability of banks across countries with different reliance on natural resources, but find a significant difference in capitalization and profitability. Banks in resource-based economies are significantly better capitalized and more profitable. The higher profitability also explains why we find a lower cost-income ratio for banks in resource-based economies, while there are no significant differences in the other two efficiency indicators. We confirm all our findings using Subsoil Assets and the Natural Export dummy as indicators of the resource nature of economies. Turning to the control

variables, we find that banks in richer countries have higher cost-income ratios but lower net interest margins and are more stable due to higher capitalization and in spite of lower profitability. Banks with a higher share of fixed assets have higher fee income, a lower loan-deposit ratio, are less efficient and better capitalized. Banks with higher non-loan earning assets have higher fee income, lower loan-deposit ratio, higher liquid assets, lower net interest margins, and are less stable. Larger banks, finally, rely more on non-deposit funding, have lower loan-deposit ratios, hold fewer liquid assets, are more efficient, and have lower capital-asset ratios and return on assets.

In a separate analysis, we compare the balance sheet composition of banks in resource- and non-resource-based economies using data from the IMF's International Financial Statistics. Specifically, we compare the asset shares of (i) credit to the private sector, (ii) credit to national and sub-national governments, (iii) credit to state-owned enterprises, (iv) foreign assets and (v) liquid assets, between banks in countries with Natural Resource Exports higher than 10% of GDP and less than 10% of GDP.

Figure 2 shows that banks in resource-based economies invest a lower share of their assets in loans to the private sector or government, but a higher share in loans to state-owned enterprises. They also hold a larger share of their assets in liquid and in foreign assets. These differences are consistent with the previous findings reported in Table 5, but also show a lower tendency of banks to fulfill their intermediation function.

Summarizing, comparisons of bank-level indicators suggest that the only differences between banks in natural-resource based economies and other economies is that banks in the former countries are better capitalized, more liquid and more profitable. There are no significant differences in the business model, in the overall efficiency or in their stability. Comparisons of asset composition across these two country groups also suggest that banks in

resource-based economies are less engaged in financial intermediation. We will now turn to demand-side data to complement this analysis.

5. Access to finance in resource-based economies

While the previous sections have focused on aggregate and supplier data to explore differences across countries with different levels of natural resource reliance, we now explore whether these differences also translate into differences in firms' financing patterns and financing obstacles. We rely on the World Bank/IFC Enterprise Surveys, which have been conducted over the past eight years in almost 100 countries with a consistent survey instrument.[12] The surveys try to capture business perceptions on the most important obstacles to enterprise operation and growth, but also include detailed information on management and financing arrangements of companies. Sample sizes vary between 250 and 1,500 companies per country and data are collected using either simple random or random stratified sampling. The sample includes formal enterprises of all sizes, different ownership types and across 26 industries in manufacturing, construction, services and transportation.

We focus on several questions that capture firms' financing patterns. First, we compute the share of enterprises with a loan or overdraft facility. Second, we compute the average share of working capital that is financed with external financial source across all enterprises in a country. Finally, we compute the average share of fixed assets that is financed with external financial source across all enterprises in a country. We also focus on a demand-side question, i.e. the share of firms in each country that states that financing is a severe obstacle to its operation and growth.

[12] See www.enterpriseseurveys.org for more details. Similar surveys were previously conducted under the leadership of the World Bank and other IFIs in Africa (RPED), the Central and Eastern European transition economies (BEEPS) in the 1990s and world-wide in 2000 (World Business Environment Survey).

Figures 3 through 6 show the correlation between Natural Resources and four indicators of firm finance. We see a negative relationship between (i) the share of firms with loans or line of credits, (ii) the average share of working capital financed externally, (iii) the average share of fixed asset investment financed externally, and the reliance on natural resources. We note, however, that these negative relationships are weak and noisy and driven by countries with high share of natural resource exports. The share of firms that rate financing as severe obstacle for the operation and growth of their enterprise, on the other hand, is not significantly correlated with Natural Resources (Figure 6).

Table 6 Panel A shows that the negative relationship between access to external finance and Natural Resources is consistent across firms of all sizes. To assess the relationship between firms' financing patterns and natural resource reliance across different size classes, we recalculate the above mentioned indicators within each country for small firms (fewer than 20 employees), mid-size companies (20 to 100 employees) and large enterprises (over 100 employees). For each size class, we compare the indicators, averaged across countries with Natural Resource Exports of less than 10% of GDP and averaged across countries with Natural Resource Exports of more than 10%. Unlike in the scatter plots, we find significant differences between firms in resource-based economies and other economies across all size groups. Firms of all sizes use less external finance in resource based economies than in other economies. The fact that large firms in resource-based economies have lower external financing as much as small firms is in contrast to general cross-country findings of significantly lower external financing by small than by large enterprises (Beck, Demirguc-Kunt and Maksimovic, 2008).

Table 6 Panel B shows additional significant differences between firms in resource-based and non-resource based economies in their access to finance. Here, we dig deeper into the loan application process of firms, splitting our sample again into countries with Natural

Resource Exports, averaged over 2000 to 2007, below 10% of GDP and above 10% of GDP. Line 1 shows that firms in resource-based economies are significantly less likely to have a loan, consistent with Figure 2. Among the firms that do not have a loan, however, there is no significant difference in the tendency to apply for a loan across countries with and without resource abundance (line 2). Among the firms that decided not to apply, however, significantly more firms in resource-based economies stated that they did not do so because of cumbersome application procedures, while a significantly smaller share of non-applicants stated as reason that they do not need a loan. Overall, the share of firms stating that they do not need a loan is about the same in both samples, which clearly suggests that it is not a lack of demand that drives the lower level of financial development in resource-based economies. There are no significant differences in other reasons for not applying for a loan. In summary, these data suggest that the lower use of external finance by firms in resource-based economies is not driven by demand but rather supply-side constraints.

Table 7 shows weak evidence for lower bank outreach in resource-based economies and other countries. Here, we follow the model of Table 3 and regress indicators of branch penetration per capita and deposit accounts per capita on (i) log of GDP per capita, (ii) time to enforce a contract, (iii) efficiency of credit information sharing, (iv) inflation and (v) Natural Resource Exports to GDP or Subsoil Assets. We focus on branch penetration, measured as branches per capita, and account penetration, measured as deposit accounts per capita. Both Natural Resource Exports and Subsoil Assets enter negatively in all regressions, but only Natural Resource Exports enters significantly in the regression of Branches per capita. Overall, this seems weak evidence for a lower outreach in resource-based economies. It suggests that it is not the lack of geographic outreach or overall lower bank penetration that drives the more limited access to external finance by firms in resource-based economies.

6. Conclusions

This paper tested for the existence of a natural resource curse in financial system development. We can summarize our findings as follows: banking systems are smaller in resource-based economies and stock markets less liquid, i.e. with lower trading activity. Financial deepening is less income-elastic in resource-based economies, which suggests that resource-based economies invest less in their economies as they grow. In resource-based economies, banks are more liquid[13], more profitable and better capitalized, but do not have different business models and are not more or less efficient or stable than banks in other countries. They also engage less in intermediation with the real economy. Firms in resource-based economies are less likely to have a loan and finance a lower share of working capital and fixed asset investment with external finance; in addition, this gap is consistent across firms of all sizes. This is not due to a lack of demand, though. Overall, it seems that supply constraints, though not necessarily related to physical outreach of banks, explain the more limited access of firms to external finance and overall lower levels of financial development.

Overall, these findings point to a natural resource curse in financial development, with negative repercussions for resource-based economies. The finance and growth relationship seems as important for resource-based economies as for other economies, so that the under-investment in the financial sector will have long-term negative repercussions for economic growth. Country characteristics and policies related to financial sector deepening – macroeconomic stability, legal system efficiency and an effective information sharing framework – hold as much in resource-based economies as in other economies. It seems that it is rather a lack of investment of the necessary financial and human resources into the financial sector that can explain the natural resource curse of finance.

[13] Note that the concept of liquidity is a different one in the case of banks and stock markets. In the case of banks, it refers to the asset holdings, i.e. a stock variable, while in the case of financial markets, it refers to an activity, i.e. a flow variable.

What are the policy implications of our findings? Policy makers in resource-based economies should care about the financial sector as much as policy makers in other economies, but have to "make the extra effort" in order to achieve the goals of inclusive financial deepening. In addition to the medium- to long-term policies – macroeconomic stability and an effective contractual and information framework – competition seems a fruitful area for policy makers to consider, given the high profitability of banks in resource-based markets, which might be partly due to lack of competition. Additional incentives for market-based lending to the private sector might be another important area, e.g. through partial credit guarantees. It is important, however, that the necessary institutional framework has to be in place in order to ensure the necessary governance structure for such interventions. It is important to note that it is not the lack of resources that constrains intermediation in these countries, but rather missing incentives.

As mentioned in the Introduction, this is a first exploratory paper on the role of financial systems in resource-based economies, with many further venues for research. Analyzing the role of financial sectors in resource-led boom and bust cycles is important, as is the role of government interference and governance in banks in resource-based economies. Disentangling financial intermediation into different components, such as enterprise and household lending seems a promising area in this context to better understand the role of financial systems in the growth process of natural resource based economies. Exploring the role of the financial systems in mitigating the effects of commodity price and then ensuing exchange rate volatility is critical for policy advice as well.

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Table 1: Finance, natural resources and growth across countries

	(1)	(2)	(3)	(4)	(5)	(6)
	GDP pc growth	GDP pc growth	GDP pc growth	GDP pc growth	Growth in Gini	Growth in Gini
Initial GDP per capita	-0.00354*	-0.00356*	-0.00274	-0.00561***		
Private Credit	0.00735**	0.00798***		0.0105***	-0.00521**	-0.00467*
Inflation	0.00185	0.00228	-0.00067	0.00142	1.30E-05	1.35E-05
Government consumption	-0.0112**	-0.0114**	-0.0101**	-0.0101**		
Trade	0.00545**	0.00552**	0.00425	0.00203	-0.00088	-0.00079
Years of schooling	0.00227**	0.00222**	0.00226**	0.00308**	0.000685	0.000494
Natural Resource Exports	-0.0284**	-0.0360**	-0.0368**		0.0212**	0.00453
Natural Resource Exports*		-0.00657				-0.0108
Private Credit						
Liquid Liabilities			0.0101***			
Natural Resource Exports*			-0.00912			
Liquid Liabilities						
Subsoil Assets				-0.00064		
Subsoil Assets*				-0.00033		
Private Credit						
Initial Gini					-0.0173**	-0.0173***
GDP pc growth					0.0464	0.0533
Constant	0.0450**	0.0462**	0.0412**	0.0699***	0.0578***	0.0581***
Observations	104	104	102	102	64	64
R-squared	0.419	0.421	0.411	0.381	0.322	0.329

Table 2: Industry growth, finance and natural resources across countries

	Industry growth	Industry growth	Industry growth
Initial share	-0.936***	-1.080***	-1.111***
Private Credit*External dependence	0.0804**	0.0535	0.0766**
Private Credit*External dependence*	0.0408		
Natural resource exports			
External dependence*natural resource exports	0.111		
Private Credit*External dependence*		0.00922	
Subsoil assets			
External dependence*Subsoil Assets		-0.0046	
Private Credit*External dependence*			0.163*
Natural resource dummy			
External dependence*natural resource dummy			-0.0677
Observations	1,105	1,132	1,147
R-squared	0.302	0.277	0.281

Table 3: Financial development across countries

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Private Credit	Private Credit	Liquid Liabilities	Loan-deposit ratio	Stock market capitalization	Stock market turnover	Structure-Size	Structure-Efficiency
Inflation	-1.750***	-0.39	-1.976***	-0.032	0.106***	-0.0296	0.45	0.00762**
GDP per capita	0.181***	0.188***	0.178***	0.0349	0.256***	0.0911*	0.128**	-0.000205
Time to enforce contract	-0.000178***	-0.000132**	-6.72E-05	-0.000238**	-0.000201	-0.000231	2.62E-05	-1.37E-05
Information sharing	0.00568	0.0197	-0.0602**	0.0654***	-0.043	0.0452*	-0.0226	0.00203*
Natural Resource Exports	-0.658***		-0.733***	0.384	0.0148	-0.704***	1.557***	-0.0251**
Subsoil Assets		-0.0145**						
Observations	142	149	140	152	106	106	102	103
R-squared	0.662	0.6	0.464	0.178	0.359	0.159	0.193	0.073
Robust standard errors in parentheses								
*** p<0.01, ** p<0.05, * p<0.1								

Table 4: Financial development over time

	(1)	(2)	(3)	(4)	(5)
	Private Credit	Private Credit	Private Credit	Private Credit	Private Credit
GDP per capita	0.902***	1.100***	1.304***	1.526***	1.544***
Inflation	-0.0538***	-0.0543***	-0.0481***	-0.0393***	-0.0477***
Natural Resource Exports	2.014***	1.655**		-4.034***	
Natural Resource Exports*	-0.418***	-0.375***		0.205	
GDP per capita					
Trade	0.194***	0.505***	1.116***	0.921***	0.924***
Trade * GDP per capita		-0.0433***	-0.132***	-0.112***	-0.122***
Natural Resource Exports*				-0.000642***	-0.00279***
Real exchange rate					
Real exchange rate*				0.00608***	
Natural Resource Exports					
Subsoil Assets*			0.0232***		0.000875
GDP per capita					
Subsoil Assets*					0.000601***
Real exchange rate					
Observations	3,428	3,428	4,315	1,803	1,770
R-squared	0.401	0.402	0.317	0.365	0.352
Number of countries	148	148	153	86	84

Table 5: Banks' business model, efficiency and stability across countries

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Fee income	Non deposit-funding	Loan-deposit ratio	Liquid assets	Cost-income ratio	Overhead costs	Net interest margin	Z-score	Equity-asset ratio	ROA
Fixed Assets	1.439**	-0.0232	-0.0584***	-0.274	3.546***	0.596***	0.00269***	-0.544*	0.278**	-0.0285
Nonloan earning assets	0.192***	0.00168	-0.0159***	0.543***	0.0385	0.00125	-0.000185***	-0.0617***	0.0113	0.000809
Size	-0.408	0.558**	-0.0474***	-1.673***	-1.708***	-0.409***	-0.00286***	-0.402	-1.990***	-0.0494**
GDP per capita	0.927	-0.314	0.0248	-0.0659	2.066***	-0.0142	-0.00361***	2.288***	0.465**	-0.0989***
Natural Resource Export	2.302	-1.636	0.222	16.49***	-24.86***	0.341	0.0161	-0.911	6.247***	2.277***
Observations	2,160	3,503	3,432	3,555	3,422	3,446	3,437	3,525	3,554	3,547
R-squared	0.061	0.014	0.137	0.525	0.155	0.409	0.268	0.075	0.341	0.132
Number of countries	113	114	114	114	114	114	114	114	114	114
*** p<0.01, ** p<0.05, * p<0.1										

Table 6: Firms' financing patterns and obstacles across countries

Panel A: Use of external finance and financing obstacles across different size groups

	Resource Based Economies	Non-resource based economies	Difference	p-value T-stat
		Small enterprises		
External finance in working capital	23.70	30.74	-7.042	0.0272**
External finance in investment	28.06	37.48	-9.424	0.0122**
Share of firms with loan	23.32	33.02	-9.709	0.0059***
Share of firms with severe financing obstacles	16.31	16.84	-0.525	0.8047
		Medium-size enterprises		
External finance in working capital	30.13	39.51	-9.377	0.0034***
External finance in investment	30.29	41.90	-11.613	0.0004***
Share of firms with loan	36.69	49.00	-12.317	0.003***
Share of firms with severe financing obstacles	13.55	12.90	0.654	0.7031
		Large enterprises		
External finance in working capital	33.05	42.82	-9.773	0.0095***
External finance in investment	34.83	43.40	-8.571	0.0216**
Share of firms with loan	49.59	59.83	-10.243	0.0243**
Share of firms with severe financing obstacles	12.14	11.16	0.983	0.6147

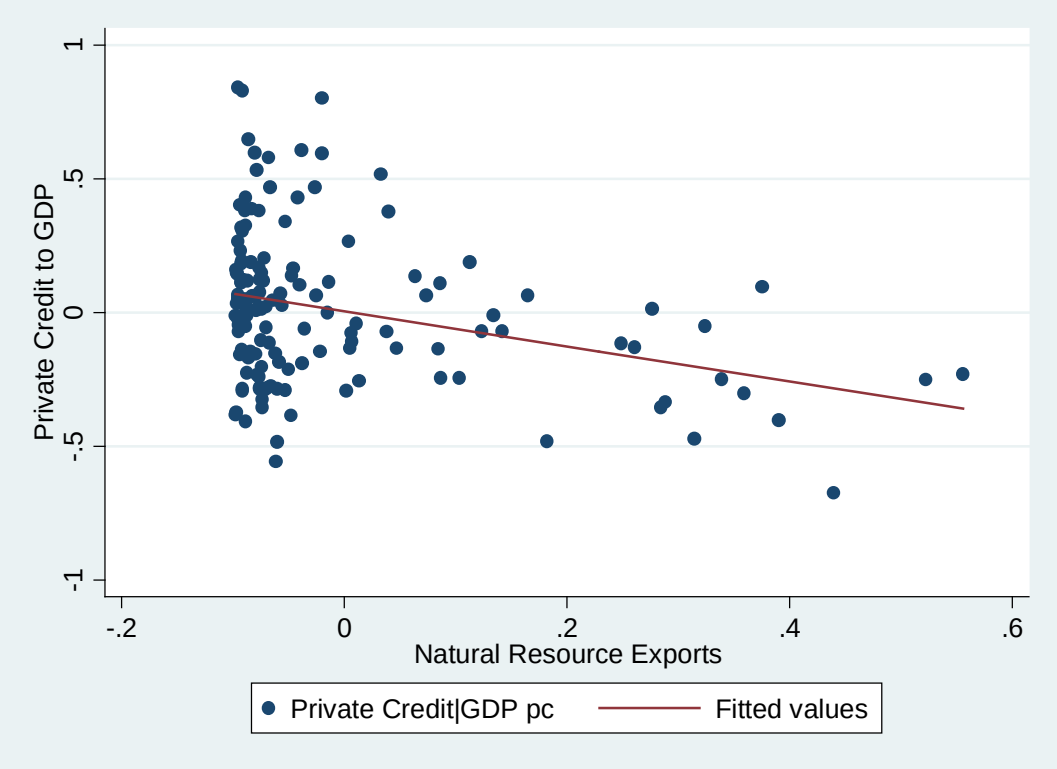
Panel B: The demand for loans across countries

	Resource Based Economies	Non-resource based economies	Difference	p-value T-stat
Do you have a loan?	30.783	42.079	-11.296	0.0066***
If you do not have a loan,				
did you apply for a loan?	13.271	13.395	-0.124	0.933
Why did you not apply for a loan				
No need for a loan - establishment has sufficient capital	47.288	61.363	-14.075	0.001***
Application procedures for loans or lines of credit are complex	15.561	8.152	7.409	0.0003***
Interest rates are not favorable	14.262	13.003	1.260	0.510
Collateral requirements are too high	6.865	6.342	0.523	0.646
Did not think it would be approved	7.364	6.488	0.877	0.562

Table 7: Banking sector outreach across countries

	(1)	(2)	(3)	(4)
	Branches per capita	Accounts per capita	Branches per capita	Accounts per capita
Inflation	-0.668	-180.6***	-1.093	-128.8*
GDP per capita	5.175***	546.8***	5.387***	532.9***
Time to enforce contract	0.000966	-0.243	0.000662	-0.137
Information sharing	0.0824	-130.8**	-0.0671	-113.6**
Natural Resource Exports	-5.528	-1,267**		
Subsoil Assets			-0.0532	-29.82
Observations	114	82	114	83
R-squared	0.283	0.504	0.302	0.483

Figure 1: Financial development and natural resource dependence



Partial scatter plot between Private Credit to GDP (vertical axis) and Natural Resource Exports to GDP (horizontal axis), controlling for GDP per capita

Figure 2: Asset composition in resource-based economies

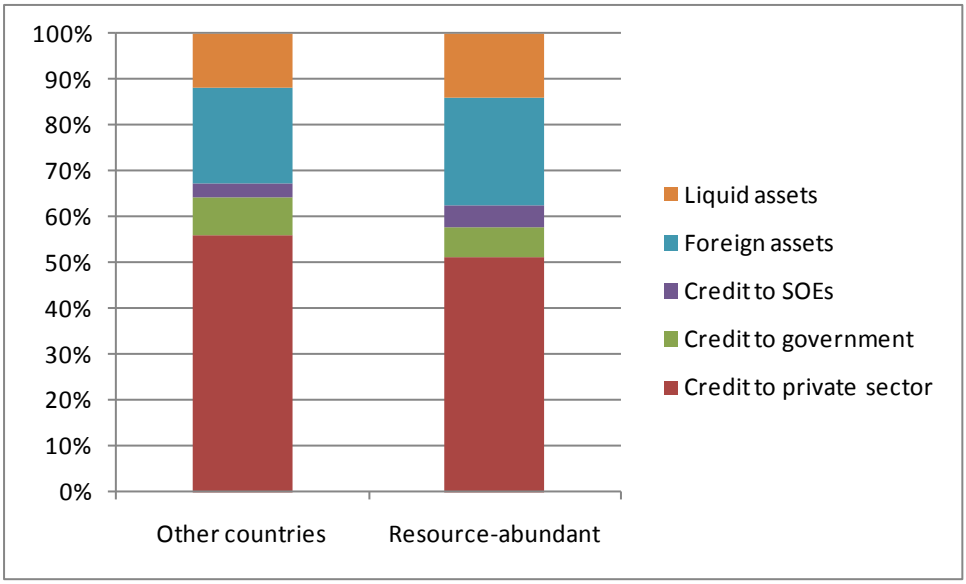
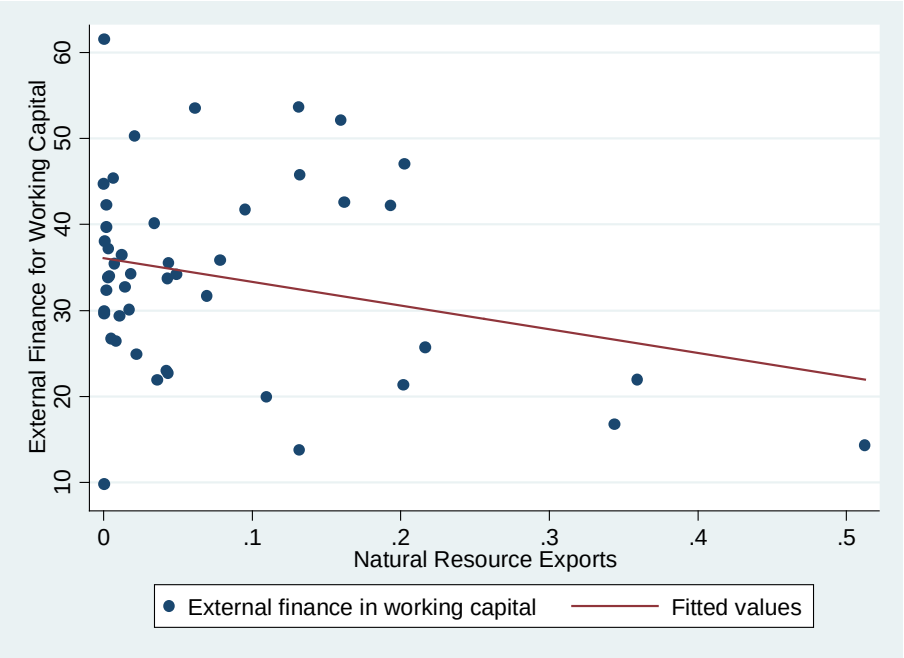
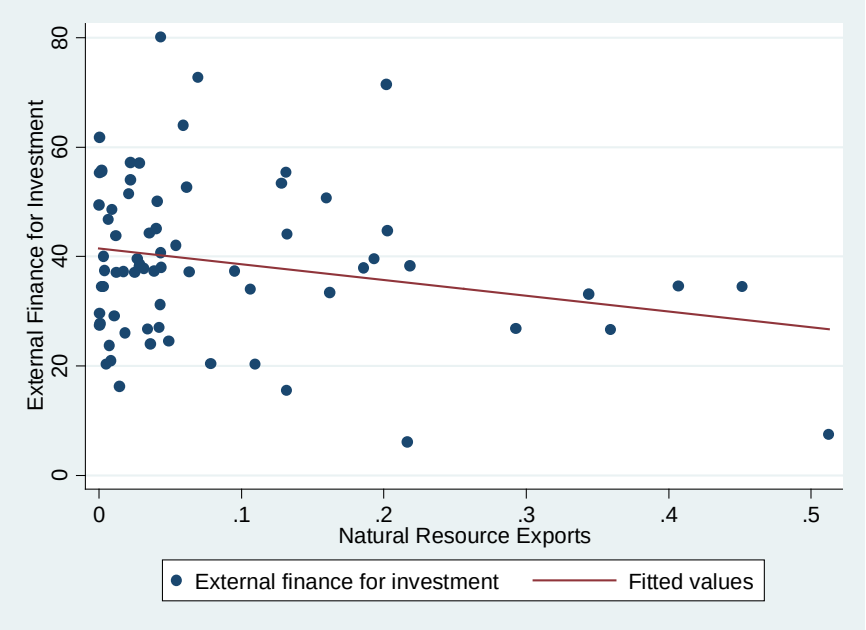


Figure 3: External finance in working capital and natural resource dependence



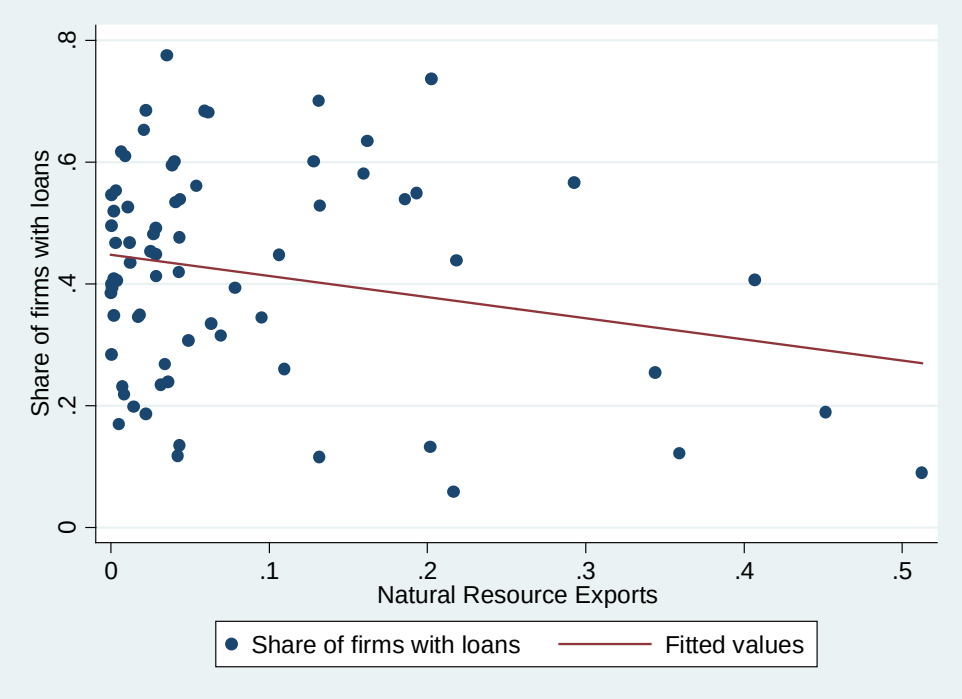
Scatter plot of average external financing of working capital, across all surveyed firms in a country (vertical axis) and natural resource exports to GDP (horizontal axis)

Figure 4: External finance in fixed asset investment and natural resource dependence



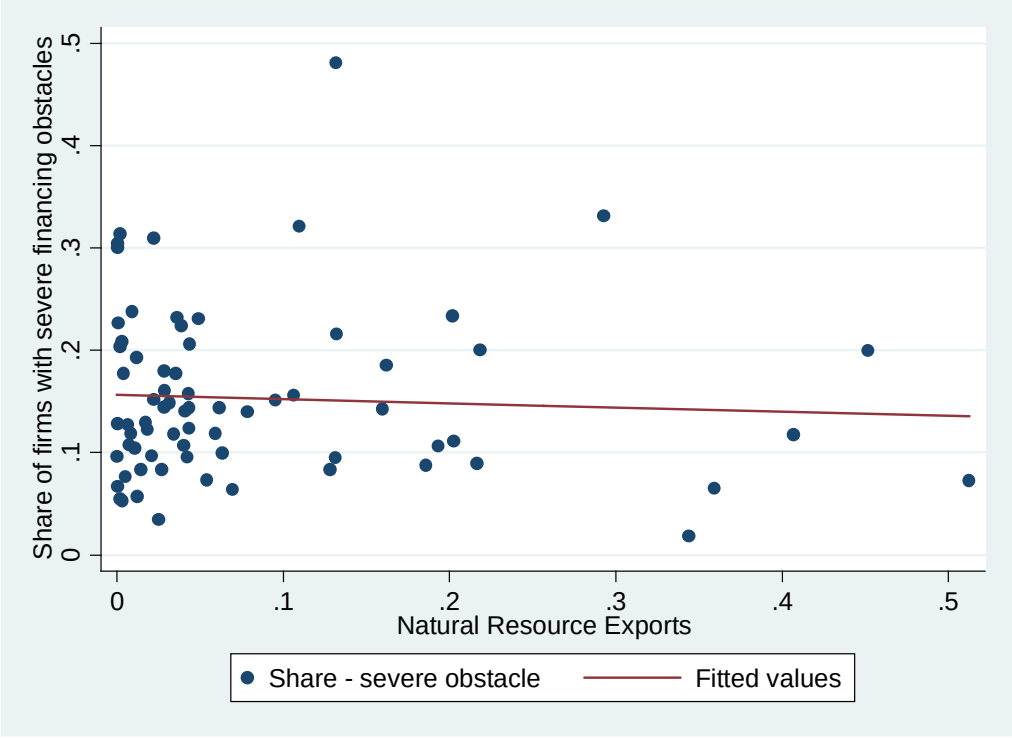
Scatter plot of average external financing of fixed asset investment, across all surveyed firms in a country (vertical axis) and natural resource exports to GDP (horizontal axis)

Figure 5: Share of firms with credit and natural resource dependence



Scatter plot of share of firms with a loan in a country (vertical axis) and natural resource exports to GDP (horizontal axis).

Figure 6: Financing obstacles and natural resource dependence



Scatter plot of share of firms in a country that rates financing as severe obstacle to operation and growth of firm (vertical axis) and natural resource exports to GDP (horizontal axis)